

CLAIMS

1. A pharmaceutical pig for transportation of a liquid radiopharmaceutical in a syringe, the pharmaceutical pig comprising:
 - an elongate polymer base having a base shell that completely encloses a base shielding element and having a first hollow center section; and
 - an elongate polymer cap that is removably attached to the elongate polymer base, wherein the elongate polymer cap, having a second hollow center and a cap shell, completely encloses a cap shielding element.
2. The pharmaceutical pig of Claim 1, wherein the elongate polymer cap is removably attached to the elongate polymer base through threaded interconnections located on the elongate polymer cap and the elongate polymer base.
3. The pharmaceutical pig of Claim 2, wherein the threaded interconnections located on the elongate polymer cap and the elongate polymer base do not allow the elongate polymer cap to rotate more than three hundred and sixty degrees (360°) in relation to the elongate polymer base.

4. The pharmaceutical pig of Claim 2, wherein the threaded interconnections located on the elongate polymer cap and the elongate polymer base do not allow the elongate polymer cap to rotate more than one hundred and eighty degrees (180°) in relation to the elongate polymer base.

5. The pharmaceutical pig of Claim 2, wherein the threaded interconnections located on the elongate polymer cap and the elongate polymer base do not allow the elongate polymer cap to rotate more than ninety degrees (90°) in relation to the elongate polymer base.

6. The pharmaceutical pig of Claim 1, wherein the elongate polymer cap and the elongate polymer base includes plastic material.

7. The pharmaceutical pig of Claim 6, wherein the plastic material includes a polycarbonate resin.

8. The pharmaceutical pig of Claim 7, wherein the polycarbonate resin includes LEXAN® material.

9. The pharmaceutical pig of Claim 1, wherein the elongate polymer cap of the pharmaceutical pig is substantially cylindrical.

10. The pharmaceutical pig of Claim 1, wherein a bottom portion of the elongate polymer base of the pharmaceutical pig is substantially bell-shaped.

11. The pharmaceutical pig of Claim 1, wherein the elongate polymer base of the pharmaceutical pig includes a top portion that is substantially cylindrical and a bottom portion that is substantially bell-shaped, wherein the bottom portion includes a plurality of flattened sections.

12. The pharmaceutical pig of Claim 11, wherein at least one flattened section of the plurality of flattened sections includes an arch-like portion.

13. The pharmaceutical pig of Claim 1, wherein the elongate polymer base of the pharmaceutical pig includes a top portion having a first diameter, a middle portion having a second diameter and a bottom portion having a third diameter, wherein the second diameter is less than the first diameter and the second diameter is less than the third diameter.

14. The pharmaceutical pig of Claim 1, wherein the elongate polymer cap of the pharmaceutical pig includes a top portion having a fourth diameter and a bottom portion having a fifth diameter, wherein the fourth diameter is less than the fifth diameter.

15. The pharmaceutical pig of Claim 1, wherein the elongate polymer base of the pharmaceutical pig includes a top portion, a middle portion and a bottom portion and the elongate polymer cap of the pharmaceutical pig includes a top portion and a bottom portion, wherein the top portion of the elongate polymer base of the pharmaceutical pig includes a plurality of flattened portions and the bottom portion of the elongate polymer cap of the pharmaceutical pig includes a plurality of flattened portions.

16. The pharmaceutical pig of Claim 15, wherein each flattened portion of the plurality of flattened portions on the bottom portion of the elongate polymer cap of the pharmaceutical pig includes an arch, wherein the plurality of flattened portions on the bottom portion of the elongate polymer cap of the pharmaceutical pig are substantially aligned in a corresponding relationship with the plurality of flattened portions located on the top portion of the elongate polymer base of the pharmaceutical pig.

17. The pharmaceutical pig of Claim 1, further includes a fluid-tight seal located between the elongate polymer cap and the elongate polymer base.

18. The pharmaceutical pig of Claim 2, wherein the threaded interconnections include at least one locking detent.

19. The pharmaceutical pig of Claim 1, wherein the base shielding element includes an open end having a protrusion located adjacent to a shoulder portion.

20. A pharmaceutical pig for transportation of a liquid radiopharmaceutical in a syringe, the pharmaceutical pig comprising:

an elongate polycarbonate resin base having a base shell that completely encloses a base shielding element and having a first hollow center section; and

an elongate polycarbonate resin that is removably attached to the elongate polycarbonate resin base, wherein the elongate polycarbonate resin cap, having a second hollow center and a cap shell, completely encloses a cap shielding element.

21. A pharmaceutical pig for transportation of a liquid radiopharmaceutical in a syringe, the pharmaceutical pig comprising:

an elongate polymer base having a base shell that completely encloses a base shielding element and having a first hollow center section; and

an elongate polymer cap that is removably attached to the elongate polymer base, wherein the elongate polymer cap, having a second hollow center and a cap shell, completely encloses a cap shielding element, and the elongate polymer cap is removably attached to the elongate polymer base through threaded interconnections located on both the elongate polymer cap and the elongate polymer base, and the threaded interconnections do not allow the elongate polymer cap to rotate more than ninety degrees (90°) in relation to the elongate polymer base.

22. An assembly including a pharmaceutical pig sized and arranged to transport a syringe, the assembly comprising:

a syringe having a needle, a barrel, a pair of wing-shaped finger grips, and a plunger; and

a pharmaceutical pig including an elongate polymer base that completely encloses a base shielding element, the elongate polymer base having a first hollow center section that is sized to surround the needle and at least a portion of the barrel of the syringe and an elongate polymer cap that is removably attached to the elongate polymer base, the elongate polymer cap completely encloses a cap shielding element and the elongate polymer cap includes a second hollow center section that is sized to surround at least a portion of the plunger of the syringe.

23. The apparatus of claim 22, wherein the syringe is selected from the group consisting of conventional syringes and safety syringes.

24. A method for transporting a syringe in a pharmaceutical pig, the syringe having at least a needle, a barrel, a pair of wing-shaped finger grips, and a plunger, the method comprising:

placing a syringe containing a liquid radiopharmaceutical in a pharmaceutical pig having:

an elongate polymer base that completely encloses a base shielding element, the elongate polymer base having a first hollow center section that is sized to surround the needle and at least a portion of the barrel of the syringe and an elongate polymer cap that is removably attached to the elongate polymer base, the elongate polymer cap completely encloses a cap shielding element and the elongate polymer cap includes a second hollow center section that is sized to surround at least a portion of the plunger of the syringe;

transporting the pharmaceutical pig containing the syringe to a medical facility; and transporting the pharmaceutical pig and the used syringe back to the radiopharmacy for disposal of the used syringe.

25. The method of claim 24, wherein the syringe is selected from the group consisting of conventional syringes and safety syringes.

26. A method for producing a pharmaceutical pig having an elongate base and an elongate cap, the method comprising:

molding a base shielding element in a first mold;

molding a cap shielding element in a second mold;

inserting the base shielding element within a third mold and injecting molten polymer material into the third mold so that when the polymer material hardens, the base shielding element is completely enclosed by the polymer material to form an elongate base; and

inserting the cap shielding element within a fourth mold and injecting molten polymer material into the fourth mold so that when the polymer material hardens, the cap shielding element is completely enclosed by the polymer material to form an elongate cap.

27. The method of Claim 26, wherein the base shielding element includes lead and the cap shielding element includes lead.

28. The method of Claim 26, wherein the base shielding element includes tungsten and the cap shielding element includes tungsten.

29. The method of Claim 26, wherein the polymer material includes plastic.

30. The method of Claim 26, wherein the polymer material includes polycarbonate resin.

31. A method for producing a pharmaceutical pig having an elongate base and an elongate cap, the method comprising:

molding a base shielding element in a first mold;

molding a cap shielding element in a second mold;

inserting the base shielding element within a third mold and injecting molten polymer material into the third mold so that when the polymer material hardens, the base shielding element is completely enclosed by the polymer material to form an elongate base having a first threaded interconnection; and

inserting the cap shielding element within a fourth mold and injecting molten polymer material into the fourth mold so that when the polymer material hardens, the cap shielding element is completely enclosed by the polymer material to form an elongate cap having a second threaded interconnection that is capable of interacting with the first threaded connection of the elongate base to secure the elongate cap against the elongate base.

32. The method of Claim 31, wherein the first threaded interconnection of the elongate base includes a locking detent.

33. The method of Claim 31, wherein the first threaded interconnection of the elongate base and the second threaded interconnection of the elongate cap do not allow the elongate polymer cap to rotate more than three hundred and sixty degrees (360°) in relation to the elongate polymer base.

34. The method of Claim 31, wherein the first threaded interconnection of the elongate base and the second threaded interconnections of the elongate cap do not allow the elongate polymer cap to rotate more than one hundred and eighty degrees (180°) in relation to the elongate polymer base.

35. The method of Claim 31, wherein the first threaded interconnection of the elongate base and the second threaded interconnections of the elongate cap do not allow the elongate polymer cap to rotate more than ninety degrees (90°) in relation to the elongate polymer base.

36. A method for producing a pharmaceutical pig having an elongate base and an elongate cap, the method comprising:

molding a base shielding element in a first mold;

molding a cap shielding element in a second mold;

inserting the base shielding element within a third mold and injecting molten polymer material into the third mold so that when the polymer material hardens, the base shielding element is completely enclosed by the polymer material to form an elongate base having a first threaded interconnection and the elongate base includes a top portion having a first diameter, a middle portion having a second diameter and a bottom portion having a third diameter, wherein the second diameter of the middle portion is less than the first diameter of the top portion and the second diameter of the middle portion is less than the third diameter of the bottom portion; and

inserting the cap shielding element within a fourth mold and injecting molten polymer material into the fourth mold so that when the polymer material hardens, the cap shielding element is completely enclosed by the polymer material to form an elongate cap having a second threaded interconnection that is capable of interacting with the first threaded connection of the elongate base to secure the elongate cap against the elongate base, wherein the elongate cap includes a top portion having a first diameter and a bottom portion having a second diameter and the first diameter of the top portion is less than the second diameter of the bottom portion.

37. The method of Claim 36, wherein the elongate base includes a bottom portion that is bell-shaped and the elongate cap is substantially cylindrical.

38. The method of Claim 36, wherein the elongate base includes a plurality of flattened portions and the elongate polymer cap of the pharmaceutical pig includes a plurality of flattened portions.